# YUSONG ZHAO

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## EDUCATION

**Columbia University** New York, NY
*Master of Science in Data Science* Feb 2024
Coursework: Deep Learning for NLP, Statistical Inference & Modeling, Exploratory Data Analysis

**Shanghai Jiao Tong University** Shanghai, CN
*Bachelor of Science in Biotechnology (Bioinformatics Track)* Jun 2022
Coursework: Algorithms, Machine Learning, Programming Approaches, Biostatistics

## SKILLS

- **Programming Languages:** Python, R, C/C++, Java, SQL
- **Tools:** PyTorch, Keras, NumPy, Git, MATLAB, Linux Kernel

## PUBLICATIONS

- **Yusong Zhao**, Edgar Y. Walker, Hao Wang, Lu Mi. Structured Visual Representation Landscape: Generating Preferred Images to Modulate Neuronal Activations in Biological and Artificial Neural Networks. *Submitted to the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*. Under review. 2024.
- Wenyuan Wang, **Yusong Zhao**, Zihao Xu, Hengyi Wang, Shreya Venugopal, Desmond Lobo, Chengzhi Mao, Qi Xu, Zhigang Hua, Yan Xie, Bo Long, Shuang Yang, Hao Wang. PRUC & Play: Probabilistic Residual User Clustering for Recommender Systems. *Submitted to the Thirteenth International Conference on Learning Representations*. Under review. 2024
- Qiuying Dai, Yanyi Chu, Zhiqi Li, **Yusong Zhao**, Xueying Mao, Yanjing Wang, Yi Xiong, Dong-Qing Wei. (2021) MDA-CF: Predicting miRNA-disease associations based on a cascade forest model by fusing multi-source information. *Computers in Biology and Medicine* 136:104706. (2020 IF: 4.589)

## RESEARCH EXPERIENCE

**Rutgers University** New Brunswick, NJ
*Research Intern, Machine Learning Lab, Advisors: Prof. Hao Wang & Prof. Lu Mi* Mar 2024 - Present
- Conducted independent research on exploring visual representations in both biological and artificial neural networks.
- Partnered with PhD students to develop the Probabilistic Residual User Clustering (PRUC) framework, enhancing recommendation systems by handling heterogeneous users through causal Bayesian methods.

**Shanghai Jiao Tong University** Shanghai, CN
*Research Group Member, State Key Lab of Microbial Metabolism, Advisor: Prof. Dongqing Wei* Jan 2021 - Jun 2022
- Participated in research group on drug interaction prediction and miRNA-disease associations.

## RESEARCH PROJECTS

**Structured Visual Representation Landscape in Neural Networks** Mar 2024 - Nov 2024
- Developed a method to interpret visual coding using neuronal activation as a prior in VAE models.
- Applied PCA to neuronal recordings for feature manipulation in biological neural representations; extended the method to artificial neural networks with datasets like CIFAR-10 and ImageNet.
- Enhanced image generation quality using Generative Diffusion Models (e.g., DDPM) and developed new sampling and optimization methods based on the structured landscape to generate samples with both diversity and realism.

**Probabilistic Residual User Clustering for Recommender Systems** Aug 2024 - Oct 2024
- Built base recommender systems (DLRM, NCF) and extracted user embeddings for clustering.
- Identified optimal cluster numbers using statistical methods (AIC, BIC), enhancing performance of our method.

**Prediction of Drug Combinations Based on Attention Mechanism** Jul 2021 - Jun 2022
- Used Autoencoders to compress diverse drug features, performed feature fusion tasks on latent features with self-attention mechanisms, model accuracy exceeding 90% on predicting drug-drug interaction .

**Analyzing miRNA-Disease Associations with Cascade Forest Model** Jan 2021 - Jun 2021
- Accessed to disease database and collect data on RNA-Disease associations to generate semantic information.
- Created a representative dataset from four different databases, and design algorithms to remove inaccurate data.
- Coded to train and test our new models with different metrics, and visualize result with matplotlib.

## HONORS & AWARDS

- Shanghai Jiao Tong University Undergraduate Scholarship, 2021
- Shanghai Jiao Tong University Academic Progress Scholarship, 2021
- Meritorious Winner (team), Mathematical Contest in Modeling, 2021